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Engine Maintenance and Service Traceability – A Service Book Proposal

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Degree Thesis for Bachelor of Engineering

Industrial Management and Engineering

Vasa 2021

BACHELOR'S THESIS

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Title: Engine Maintenance and Service Traceability – A Service Book Proposal

Date: 22.4.2021 Number of pages: 29 Appendices: 1

Abstract

This thesis is written on behalf of Wärtsilä Energy. The purpose was to create a proposal for a service book, in which both Wärtsilä and the customer could trace all service and maintenance done in an engine's complete lifecycle. Today, the engine's lifecycle data is scattered over several different systems and the service history is challenging to trace. The thesis maps out the internal and external tools relevant for the traceability of the engines, presents what content the service book should include, and which tools could be suitable as the foundation.

The method used in the thesis is qualitative. The material has been gathered from internal documents and through meetings and interviews with General Managers, Managers and Experts within different departments of the business. The theory has been gathered from literature and academic journals.

The result summarizes and presents eight different tools, systems and platforms used today within Wärtsilä Energy for engine traceability. The tools are evaluated, and a possible foundation for the service book is presented. Lastly, the result is discussed.

The result and discussion of the thesis is considered sensitive material and will not be published to the general public.

Language: English Key words: Maintenance, Traceability, Service, Documentation

EXAMENSARBETE

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Titel: Att spåra motorns underhåll och service – Förslag till en servicebok

Datum: 22.4.2021 Sidantal: 29 Bilagor: 1

Abstrakt

Det här examensarbetet är skrivet på uppdrag av Wärtsilä Energy i syfte att skapa ett förslag till en servicebok där både Wärtsilä och kunden enkelt kan spåra all service som gjorts på en motor från dag ett i motorns livscykel. I dagens läge är motorns historia spridd över ett flertal system och servicehistorian är utmanande att spåra. Det här examensarbetet kartlägger Wärtsiläs interna och externa system som är relevanta för motorernas servicehistoria, presenterar vilket innehåll serviceboken bör ha samt vilka verktyg som kunde fungera som bas för serviceboken.

Metoden som använts i examensarbetet är kvalitativ. Materialet har samlats in från interna dokument och från intervjuer, möten och diskussioner med general managers, managers och experter från olika avdelningar inom Wärtsilä Energy. Teorin har samlats från litteratur och akademiska journaler.

Resultatet summerar och presenterar åtta olika verktyg, system och plattformar som används idag inom Wärtsilä Energy för att spåra motorns historia. Verktygen utvärderas och examensarbetet presenterar en möjlig bas för serviceboken. Slutligen diskuteras resultatet.

Examensarbetets resultat och diskussion anses vara känsligt material och kommer inte publiceras för allmänheten.

Språk: engelska Nyckelord: underhåll, spårbarhet, service, dokumentation

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ABBREVIATIONS

Here follows central abbreviations and terminology used in the thesis:

MTTF	Mean Time to Failure
CBM	Condition-Based Maintenance
MIS	Maintenance Information System
Teams meeting	Microsoft Teams is an Office 365 based workspace. Can be used for chatting, calls and virtual meetings etc.
IDM	Integrated Document Management. Wärtsilä's former documentation system.
DCM365	Document Control Module. Online platform and workspace.
(Q)EHS	(Quality), Environment, Health and Safety
SQAD	Site Quality Assurance Documentation
PQA	Project Quality Assurance team. SQAD-team.
SQP	Site Quality Plan. SQAD-related.
PQMP	Project Quality Management Plan. SQAD-related.
ITP	Project Inspection and Test Plan. SQAD-related.
TKB	Technical Knowledge Base
Online Services	Services in Wärtsilä Online
SWR	Service Work Report
FSM	Field-Service Mobility app
OEM	Original Equipment Manufacturer
SAP	Systems Applications and Products. ERP (Enterprise Resource planning) system used in Wärtsilä.
Service bulletin	Umbrella term for different technical documents, such as service letters, technical bulletins, instructions, records etc.
PIP	Project Improvement Projects

LCS	Life Cycle Support
PCT	Product Conformity Test. Test run in factory.
Site Handbook	Provides information and instructions for site activities during site execution and commissioning.

1 Introduction

This chapter will present the background and purpose of the thesis. Further, delimitations, and disposition of the thesis will be described.

1.1 Background

Wärtsilä Finland Oy is a Finnish company within the energy and marine markets. The company, established in 1834, is focusing on smart technologies and complete lifecycle solutions. Over the years, Wärtsilä has gained experience in a wide range of business areas and companies, and the strive to constantly maximize the environmental and economic performance of the power plants and vessels is one of the main reasons for the company's success today. The company is divided into two businesses: Wärtsilä Energy and Wärtsilä Marine. (Wärtsilä, 2021a). This thesis is written for Wärtsilä Energy.

In the year 2020 Wärtsilä had approximately 18.000 employees operating in over 200 locations in more than 80 countries all over the world. The same year Wärtsilä had a net sale on total 4.6 billion euros. The company is listed on Nasdaq Helsinki and Håkan Agnevall is the CEO and President of Wärtsilä Corporation since February 2021. (Wärtsilä, 2021a). Wärtsilä Energy net sales reached approximately 35 % of Wärtsilä's total net sales year 2020. (Wärtsilä, 2020). Wärtsilä Energy handles the engine's whole lifecycle, from construction to service.

The assignment was given by Product Quality team within Quality Department in Wärtsilä Energy. The team is focusing on product quality improvement by receiving information about engines and auxiliaries from the field, especially before handing over. A service book would facilitate the work especially for the team working with Non-Conformities. If the service history would be meticulously documented, and gathered in one place, investigation and issue solving would be easier and more efficient.

Wärtsilä has a broad range of tools and systems where information about the engines' services and maintenances is stored and shared. They are divided into internal tools, systems, and platforms where the Wärtsilä user can store, search and access information internally and into tools where the customer can access information about the products and communicate with Wärtsilä customer contacts.

Within Wärtsilä, there is no tool where the user could easily trace all service done, by both Wärtsilä and customer, on a specific engine from day one and over its whole lifecycle. When searching for specific data, documentation and information, the user must search through a vast number of different databases. The many systems used are developed particularly for each phase of the building and execution of the engine and the plant and it can be challenging to find specific information. The thesis focuses on the tools, systems and platforms used for documentation processes that are devoted for documenting an engine’s lifecycle.

1.2 Purpose and Delimitation

The aim of the thesis is to develop a service book proposal where both Wärtsilä and their customers can document and share information about all service and maintenance done on an engine’s entire lifecycle. A vital part of the work is to map the existing tools, systems and platforms that may be relevant for the purpose of the thesis to get the big picture of how documentation is handled and how these are connected. The word “tool” will be used generally as an umbrella term for the tools, systems, and platforms in the thesis to ease the writing and reading of the thesis.

The comprehensive number of tools within Wärtsilä made it crucial to delimitate which ones to focus on. Therefore, some requirements were stated. Firstly, the tool had to be used within Wärtsilä Energy. Secondly, the tool had to, in some way or another, be significant for the documentation’s traceability of the engine’s lifecycle. The tool’s interaction with the customer, and importance for the same, was also considered.

This work is the initial investigation of the subject. To limit the span of the work it will stay at a proposal. It will investigate if a service book of this nature is needed and possible with the means accessible. The thesis depicts the tools, systems and platforms that are available, and relevant for the purpose, in Wärtsilä Energy and how they are used specifically within the business. Lastly, it aims to create a proposal for the content of the service book and what tool, systems or platform that could be suitable.

The theoretical part of the thesis covers the matter from a preventive maintenance point of view, since this is the way of working for Wärtsilä. The theory also includes maintenance documentation. Unfortunately, there are little studies to be found regarding the use and benefits of similar service books in and off field – however, one study by Lehtonen, Ala-Risku and Holmström (2012) gave an interesting view on field service technicians and what information is important for their work.

The thesis does not handle the technical strucure of the existing tools in depth nor investigate the possibility of them connecting in practice. Neither does it give any proposal regarding possible design of the user interface of the service book.

1.3 Disposition

The thesis is divided into chapters and the disposition from here is as follows:

Chapter two presents the theoretical aspect of the thesis. In chapter three the method used for achieving the purpose of the thesis is explained.

Chapter four presents the result of the thesis. The result is threefold and is divided as follows: The different tools within Wärtsilä that are relevant for the traceability of the engines lifecycle, the content of the service book and the tools that could be suitable as base for the service book.

In chapter five the result is discussed, and chapter six concludes the thesis.

2 Theory

This chapter depicts the theoretical aspect of the thesis. The theory chapter is twofold, due to the nature of the work. Firstly, different types of preventive maintenance are discussed. Secondly, maintenance documentation is handled.

2.1 Types of Maintenance

Maintenance costs are normally a major part of the total operating costs in a plant. There are mainly three different divisions of preventive maintenance: improvement-, preventive-, and corrective maintenance. (Mobley, 2004) See Figure 1 for illustration. Condition-based maintenance (CBM) is also discussed.

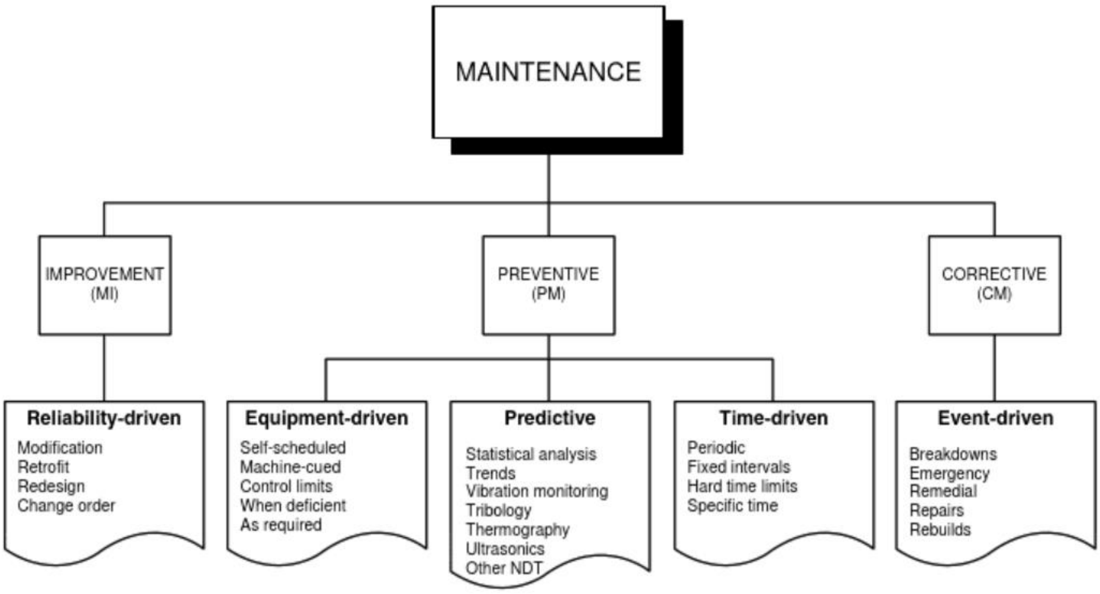

Figure 1 Structure of maintenance. (Mobley, 2004, p. 9).

Wärtsilä provides several different lifecycle and maintenance solutions after plant is handed over to customer. These maintenance agreements are an important part of the business and they offer solutions for care, custody, and control in different extent (depending on the agreement) of the asset or assets of the customer. (Wärtsilä, 2021b). Wärtsilä's maintenance strategy strives for reliability and smooth operations. Well-organized preventive- and a high-qualitative and efficient reactive (corrective) maintenance strategy is how Wärtsilä ensures smooth everyday operations and cost effectiveness. (Wärtsilä, 2021c).

Improvement Maintenance

Mobley (2004) writes that improvement maintenance strives to reduce, or even eliminate, the need for maintenance. Often the maintaining itself takes overhand and we forget the need to eliminate the source. Koussaimi, Bouami and Elfezazi (2016) concludes that improvement maintenance is mainly concentrated within these three following activities:

1. Removal of abnormalities by doing root cause analyses.
2. Doing adaptions and modernizations due to new production requirements; and
3. Renovations to increase equipment lifespan.

Improvement maintenance is in Wärtsilä mainly handled via service bulletins (service letters, technical bulletins, instructions, records etc.). The purpose of them is to provide Wärtsilä customers, i.e., operators, owners and Wärtsilä internal users with new and updated technical information regarding Wärtsilä products and services. (Knubb, 2020).

Preventive Maintenance

The preventive maintenance management is always time driven. That means, that maintenance operations depend on hours of operation or elapsed time. Machine repairs are scheduled based on the mean time to failure (MTTF) statistics. The MTTF indicates that a machine’s, or a system’s probability of failure is higher during its first weeks of operation, in case of installation problems. The probability of failure is comparatively low after these initial weeks and this probability extends over an extended period. After the expected lifetime of the machine or system, the probability of failure sharply increases with time elapsed. (Mobley, 2004). See Figure 2 for illustration.

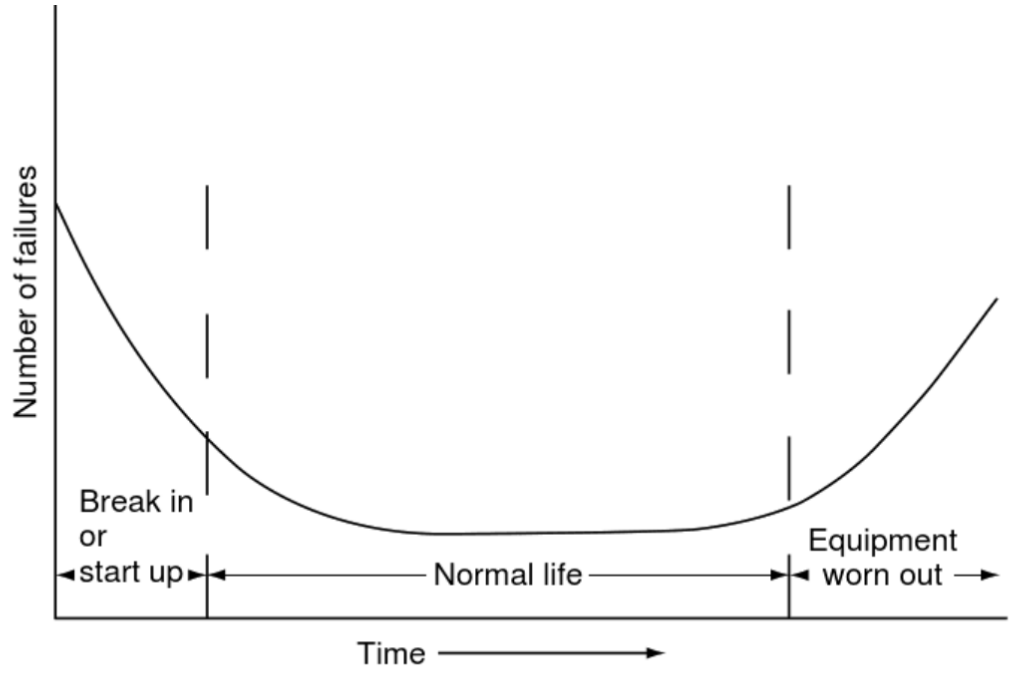

Figure 2 An illustration of the mean time to failure (MTTF). (Mobley, 2004, p. 3).

A scheduled repair is minimizing the repair time and the excessive labour costs associated with the run-to-failure management. Scheduling the repair also provides the resources of minimizing the adverse impact of delayed shipments and lost production. (Mobley, 2004).

Condition-Based Maintenance

Condition-based maintenance (CBM) is the regular monitoring of the machine or system to maximize the interval between repairs and unscheduled failures. This maintenance method uses the actual operating condition of the machines and systems of the plant to optimize the total operation of the plant. Its main goal is simply to improve product quality, productivity, profitability, and general effectiveness of the plant. (Mobley, 2004).

CBM is often referred to as predictive maintenance but may be categorized as an own type of maintenance (Veldman, et al., 2011). This type of maintenance is condition driven and rather than using average-life statistics such as MTTF for scheduling maintenance, direct monitoring of i.e., vibration monitoring, tribology, thermography, visual inspection etc. is used to determine the system's efficiency, mechanical condition, or other indicators to assess the actual MTTF or efficiency loss. (Mobley, 2004). Identification of failure and needed maintenance is based on threshold values (Veldman, et al., 2011). At the best, the traditional average-life methods can give a guideline to the life span of the machine or system. With this method, unscheduled failures can be minimized, the repaired equipment can be monitored, and problems can be identified before they get crucial. If detected early, most mechanical problems can be minimized. (Mobley, 2004). Prajapati et. Al (2012) also writes that industries that implement CBM as maintenance strategy can save money or improve their operational efficiency.

CBM as a concept was first introduced as predictive maintenance in the 1940s by a railway company in USA. CBM methods were used to detect fuel, oil, and coolant leaks in the engine by reading pressure and temperature changes. By using these CBM methods, the company could successfully reduce unplanned failures and fix them in time. US Army quickly adopted the idea of CBM as their key maintenance strategy. CBM as a concept has later been implemented in many industries, mainly in manufacturing, aerospace, automotive and military and today the advanced information technology, with its possibilities with data collection and retrieval, decision support, data analysis and network bandwidth, has helped the CBM technology area grow. The possibility to collect, retrieve and analyse great amounts of data over a long time can give deeper insight on system health, performance, root causes and forecasts. (Prajapati, et al., 2012).

Wärtsilä offers a broad range of different predictive maintenance solutions and CBM is one of them. This means, that many maintenance decisions are done based on analysis, prognostics and certain parameters and maintenance actions can be executed on time before a failure arises. Most CBM monitoring is handled remotely. (Pietilä, n.d.).

Corrective Maintenance

Most maintenance today is corrective. It can be breakdowns, repairs, or emergencies. No matter how preventive or predictive the maintenance management is, repairs will always be needed. However, better improvement- and preventive maintenance can lessen the need for emergency repairs. To detect the problems before they lead to failures, at the lowest cost possible, is the real challenge. (Mobley, 2004)

2.2 Maintenance Documentation

Kelly (2006, p. 168) defines maintenance documentation as:

> *Any record, catalogue, manual, drawing, or computer file containing information that might be required to facilitate maintenance work.*

Further, he describes a maintenance information system (MIS) as:

> *The formal mechanism for collecting, storing, analysing, interrogating, and reporting maintenance information.*

Most systems today are computerised (Kelly, 2006).

By studying an extensive number of computerised and paper-based maintenance information systems, Kelly (2006) writes that MIS can generally be made up into seven interrelated modules. Some of the modules are strongly related to the thesis, while some are of a more general character for maintenance documentation operations. The ones with importance for the thesis are described more in detail. The modules are:

1. *Plant inventory*, which is the primary way into the system and consists of a coded list of the units. From Wärtsilä point of view this would generally mean the engine's serial number. For power plants and installations, information needed can also be found via i.e., power plant number or customer ID. These numbers and codes are used as base in most of Wärtsilä documentation systems for finding information regarding engines or power plants.

2. *Maintenance information base*, which gathers maintenance information in a database. The information can for example be job tasks or unit life plans for each unit. This module is the focus area of the thesis. Wärtsilä gathers maintenance related information in several systems and the aim of the thesis is to create a service book where all maintenance information could be found in one place.

3. *Maintenance schedule*, which lists the scheduled preventive maintenance tasks for each unit.

4. *Condition monitoring*, which is a schedule of the CBM tasks for each unit.

5. *Short-term work planning and control* is the information and/or documentation necessary to perform a maintenance job. The system needs to schedule and plan corrective, preventive, and other modification jobs. The job itself is given by electronic work orders or hard copies and performed by field-service technicians. When the job is done, the information coming back and gathered through the work order is used to update the systems used for planning and maintenance control.

Wärtsilä has developed specific systems for short-term work planning and control. Work orders are received in a mobile application to the service technicians. When the work is done, a service report is written and information from the work is used, as mentioned above, for planning and maintenance control.

6. *Shutdown work planning and control*, also the long-term planning system, schedules the major work. The short-term planning system is then used to perform the work.

7. The *Maintenance control system* gathers information from several sources, such as work orders and shift records, to create reports for e.g., plant reliability and cost control.

2.2.1 Maintenance Documentation and Work Planning

Informational support systems and its benefits for maintenance services are widely known. (Lehtonen, et al., 2012). To be able to have and maintain a high-performance and qualitative service production process, the information available and the use of it is critical. (Sampson & Froehle, 2006). The importance of proper tracking, control and retrieval of documentation is also pointed out by Mobley (2004), for maintaining an effective life cycle resource management. It has been noted that a lack of information and documents regarding correct procedures and parts for the failed equipment, comes with a higher risk of failed field-service visits. (Lehtonen, et al., 2012).

Kelly (2006) lists several maintenance-related information for each unit in the inventory that is essential for efficient work planning. These are collected to the (1) *maintenance information base history* (as described in chapter 2.2.). These are, without mutual order:

- Technical data
- Drawings
- Spares
- Instructions manuals for maintenance
- Catalogue for preventive and corrective works
- Safety information
- Operating instructions
- Life plan
- Rotable tracking

Further, Kelly (2006) writes that *plant history* records, that is a part of both the *maintenance information base history* (1) and *maintenance control system* (7) (as described in chapter 2.2.), have a twofold function, meaning that it contributes to both maintenance information base, i.e., service history and the system for plant reliability control (e.g., identification of recurring failures and their root causes). The plant reliability control system also supports the work planning. The plant history records should, as a minimum, include date, unit, duration, and resources used, unit condition and work details, parts replaced, and materials used (Kelly, 2006).

The main difference between these is that the information base history gives an overall information for each unit (in this case: engine) and should provide information what has been done in regards of maintenance (e.g., replacements, repairs, and symptoms) for the next maintenance job. The plant history is collected to the maintenance information base and will also have a proactive character in regards of the future. (Kelly, 2006).

In a study made by Lehtonen et al. (2012) it is investigated what type of life-cycle information of a piece of equipment that is most valuable for field-service technicians. Operating data of the equipment was listed as the most valuable piece of information. Other useful data was spare parts installed and service history. Data on operating environment was listed as the least important item. The study concludes that a better accessibility of information would improve the fault-diagnosing phase.

Lehtonen et al. (2012) also noted that a consequence of missing information leads to valuable on-site time must be spent searching for information from several different sources. Better data can reduce the time spent on diagnosing problems and better availability of data can reduce the time acquiring information.

When creating the service book proposal, the extent of what maintenance documentation included in the book must be closely considered. The aim is to develop a proposal for a user friendly and compact book, and data, that might be necessary for the maintenance information base, is not necessarily important for the aim of the service book.

3 Methods

The method chapter will describe the way material and information had been gathered. The method aims to fulfil the purpose of the thesis.

3.1 Choice of Methods

To be able to make a problem researchable, a research design should be chosen. The research design is a model that will describe what, or who, needs to be studied to retain necessary information to solve the problem. (Carlström & Carlström Hagman, 2007). In other words, the research design chosen is essential for the outcome of the study.

The aim of the thesis was to create a proposal for a service book where all service history for an engine can be found in one place. A major part of the thesis was to map out all systems essential for documenting the engine’s lifecycle. Some basic information about the tools could be gathered from Wärtsilä intranet or internal documents, but to be able to obtain more detailed information, and to be able to ask follow-up questions the method chosen for the thesis is qualitative. Carlström and Carlström Hedström (2007) also points out that in interviews with a more open nature, new dimensions of the studied subject can be found.

Another alternative would have been using a quantitative method and using surveys. However, Eliasson (2014) writes that a quantitative method requires a problem that can be designated with numbers, which was not the case in the thesis where the questions and themes had to be adapted for each interviewee. Another risk with surveys is less respondents, which was not acceptable since the persons interviewed were one of the sole experts within the area. The need for discussion and follow-up questions was also essential for reaching the aim of the thesis, which the quantitative method as the main research design does not include.

Research has been done mainly through interviews (meetings) and discussions and in some extent through data collection. According to Carlström and Carlström Hedström (2007), the qualitative research method assesses people’s experiences and perspectives, both the participants and the researcher of the study. Therefore, it is possible that the information can be interpreted in several ways.

3.2 Meetings

The initial meeting included my supervisor at Wärtsilä and my manager. It was held as a Teams meeting. At this stage the purpose and goal were quite set, and the problem area was thoroughly explained. It was clear that an investigation and proposal for a service book was to be done, but the delimitation was not yet decided. This was informed to my supervisor at Novia University of Applied Sciences and it was agreed that the scope of work was adequate. Along the process regular meetings with my supervisor at Wärtsilä helped me keeping course and focusing on the purpose. My supervisor could also answer some general questions I had regarding Wärtsilä's way of working. My supervisor from Novia supported me with the theoretical and academical part of the thesis.

Interviews (Meetings) in Depth

Interviews were the main source of information and they were hold as Teams meetings with Wärtsilä stakeholders within Wärtsilä Energy. The interviewees were General Managers, Managers and Experts within different departments of the business, but also people in other positions were interviewed. The interviewees and the tools to focus on were chosen along with the progress of the thesis. See Table 1 below. The interview questions varied depending on the aim of the interview. The goal of some interviews was to get to know more about specific tools and systems, while other assisted in moving forward with the process or investigating the way of working in specific parts of the engine's lifecycle. List with interview questions can be found in Appendix A.

Table 1. List of interviewees.

Department and subject	**Interviewee (title only)**
Energy Warranty Services **Initial interview to get an overall picture over Wärtsilä systems**	General Manager
Commissioning Management (2 separate interviews) **Way of Working**	General Manager
Project Quality Assurance **SQAD**	Manager

Online Services **Wärtsilä Online**	General Manager
Product Documentation **DCM365**	General Manager Application Manager
Field Services & Operations Technical Services **Overall picture over Wärtsilä systems**	General Manager Service Manager Strategic Resource Account Manager General Manager
Customer Support **Issue Register**	General Manager
Service Bulletins **Service Bulletins & TKB**	Manager
Field Service **Way of Working & SWR**	Process Expert
Process Development **TKB**	Manager

The interviews provided a deeper insight into the problem area and gave an understanding of the systems', tools', and platforms' structures. At the same time, they contributed to ideas and proposes for what could be possible, and challenging, in forming a service book like this. In the beginning of the process, it was quite unclear where to start, therefore some interviews with some representatives of different phases of power plant execution gave an understanding of how things work in practice and/or gave a push forward how to proceed with the process. An opportunity to participate in a development meeting for Technical Knowledge Base gave inspiration for solutions that could be useful for the aim of the thesis.

The interviews lasted approximately 30 minutes to one hour. They were mostly one-to-one but sometimes with several attendees. They were mainly semi-structured since they were based on a list of questions and themes that were sent along with the invitation to the interviews. Naturally, some interviews also had a more unstructured character, but the information requested was mostly obtained.

4 Result (Confidential)

5 Discussion (Confidential)

6 Conclusion

The purpose of this thesis was to form a proposal for a service book wherein Wärtsilä and their customers could easily find and trace all service done on an engine over its complete lifecycle. The aim was also to map out the tools, systems and platforms that are used within Wärtsilä Energy today for full traceability of an engine.

Originating from several interviews, meetings, internal material, and discussions, eight tools, systems and platforms were mapped out and the content of the service book and possible tools were presented. Interviews were chosen as a main method as this was the most efficient way of gathering information. The interviews also made room for follow-up questions and discussions.

A solution where the service book is twofold, with one external view for the customer and one internal for Wärtsilä, is presented as most likely. The external and the internal views would communicate, and data would be replicated to the tool. The possibility of linking to other internal systems for information is also proposed.

Creating a service book can be challenging due to the character of some tools. Many are add-ons and specialized for their specific tasks, departments, and businesses today, and some of the presented communicate and some do not. However, some tools are more suitable, and more likely, as foundation than others due to their nature.

6.1 Challenges

The thesis was written in the middle of Covid-19 and most Wärtsilä employees were working remotely. All meetings and interviews were held via Teams meetings and that has been both challenging and developing. Schedules were often full, and it could take 2-3 weeks to arrange a one and one meeting. However, the new way of working was also rewarding, the more meetings held, the easier and more natural it felt.

6.2 Proposal for future research

Future research could be a closer investigation of the technical possibilities and challenges of Salesforce, TKB or a completely new tool as foundation for the service book. The interest from the customer's side could also be investigated.

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Appendix

Appendix A. Interview questions.

Initial interview on Wärtsilä way of working with documentation.

1. Briefly describe the systems that you work with. What do they look like in practice; where does it begin and where does it end? How are things done and where is info stored/shared?
2. What documentation goes to the customer, what does not? What do we know about customer documentation?
3. What is instructed to the customer today, for the customer to maintain machines and the powerplant?
4. Is there already some way of everyday documentation in the powerplant what has happened? (before and after handing over) and does Wärtsilä sponsor/encourage this type of documentation or is it completely on customer's responsibility? Instructions how the power plant should be taken care of?

Questions for interview on different tools, platforms, and systems:

1. Who (departments, teams…?) are the main users of the >particular tool<?
2. When in the project phase do Wärtsilä start using ><?
3. To what other systems/tools does >< link?
4. How do Wärtsilä use >< internally and how does the customer use it?
5. What do You think ><'s role would be in a book like this?
6. Other thoughts, suggestions, pros/cons…?

Tour in the tools discussed.

Way of working in Commissioning (second interview):

1. What would you like to see in a tool like this, from commissioning point of view? What information is important to have and to document?
2. What tool/system do you think would be suitable as base for the service book?
3. Pros/cons with a service book like this?
4. Other thoughts, what are you overall opinions, would this be a useful system? Other suggestions?

Way of working and SWR:

- What tools does field-service mainly use – for example, when a service technician does an installation/service, where is this reported/stored?
- What information is vital for the technician when arriving to do the service?
- From where do the technician obtain this info?
- Some other info that could be interesting? Your view on this, pros, cons, suggestions?